VI.—*Observations of the Magnetic Dip and Intensity at Madras. By* T. G. TAYLOR, *Esq. H. C. Astronomer.*

Notwithstanding the value which has of late years been attached to observations of the Magnetic Dip and Intensity, I may, I believe, safely state, that the whole of British India has failed to put on record a single good set of experiments to this end. With a view to supply this deficiency for *Madras*, I have availed myself of the loan of a very excellent dipping needle, the property of Captain DRINKWATER, of His Majesty's ship *Conway;* and of two magnetic intensity needles which were brought out by the same officer, and are the property of Captain JAMES CLARKE ROSS, R. N. The dipping needle, which was constructed on purpose for the *Conway*, differs, I believe, in no respect from the ordinary construction, save that it is one of the best instruments I have met with, and, as far as I can see, absolutely faultless. The observations for Dip are as follows.

Observations for Dip made at the Madras Observatory, situated in Long. 5*h.* 21*m.* 7*s.*8 *East of Greenwich, and Lat.* 13° 4′ 8″. 8 *N. on the* 26*th April,* 1837.

With Needle marked No. 1.

Face of Instrument E 2st.

No.	A.	B.	No.	A.	B.
1	7° 26′	7° 28′	2	6° 16′	6° 14′
3	7 6	7 4	4	6 12	6 8
5 Inverted the axis,	7 24	7 17	6	6 4	6 8
7	7 30	7 24	8	6 16	6 22
	Reversed the Poles.				
9	7 28	7 22	10	6 34	6 38
11	7 12	7 7	12	6 16	6 21
13	7 16	7 24	14	6 24	6 28
15	7 26	7 23	91	6 27	6 33
Mean,	7° 21′ 0″	7° 18′ 37″		6° 18′ 37″	6° 21′ 30″

Needle marked No. 2.

1	7 31	7 20	2	7 2	6 38
3	7 31	7 42	4	7 8	6 58
5 Inverted the axis,	7 42	7 25	6	6 55	6 14
7	7 50	7 30	8	6 45	6 55
	Reversed the Poles.				
9	7 24	7 6	2	6 0	6 21
11	7 26	7 4	4	6 10	6 28
13	6 34	6 44	6	6 15	6 0
15	6 34	6 43	8	6 23	6 4
Mean,	7 19 0	7 11 45		6 34 45	6 34 45

And taking the general mean, we get the true Dip

with Needle No. 1 6 49 56 No.

ditto ditto ,, 2 6 55 4

Mean, 6 52 30

N. B. The numbers 1, 2, 3, &c. exhibit the order in which the observations were made. During the present century, I cannot find that any observations for Dip have been made at *Madras*, but there is one result on record dated 1775, when Abercrombie found it to be 5° 15′ N.; if this result can be trusted, it would appear that the Dip is on the increase at the rate of 1′ 34″ in a year.

With regard to the needles employed for the magnetic intensity, it may be necessary to state, that they are constructed after the model of that of Professor Hansteen. The needles are cylinders, $2\frac{1}{2}$ inches long and .3 inch in diameter, save that the ends are abruptly sharpened to a point; these needles are freely suspended on their centres by a few filaments of unspun silk, which are hooked on to a brass stirrup, moveable upon the needle; by which means a perfect adjustment to horizontality can be effected; the needle thus suspended is enclosed in a rectangular glass box immediately over a divided circle, from which the arc of vibration can be read off and the number of oscillations counted. The zero of measure here employed, is the time of performing 100 vibrations at a temperature of 60°, commencing with an arc of 20° and ending at from 2° to 4°.—If these measures could be observed to ultimate accuracy, it would be worth while to reduce the times of vibration under these circumstances to the times of describing an infinitely small arc, as has been done by Hansteen, and on account of buoyancy, to a vacuum; but since such is not the case, the result will be obtained to all useful accuracy by supposing the correction common to each set of observations, by which the reductions, which are rather operose, are avoided: the reduction to a temperature of 60° is effected by applying the correction, 0,00017 t. (where t represents the time of performing 100 vibrations);—a formula which is derived from experiment. The two needles used in the following observations are distinguished from one another by a sign × on one of them. This needle in *London* at a temperature of 60° performed 100 vibrations in 442,76 seconds of mean time, whereas the other needle performed 100 vibrations under the same circumstances in 461,96 seconds; the former needle is further distinguished from the latter from its having been long in use in England, and as having exhibited a remarkable degree of steadiness in its magnetism during the late magnetical experiments instituted in Ireland under the auspices of the British Association; added to which, these needles are calculated to excite a more than ordinary degree of interest from the circumstance of their having been employed by Sir John Ross in the perilous North Polar Expedition, from which he has lately so fortunately returned. The observations at *Madras* are as follows.

No. 3, Private mark ×.

1837.	Arc.	Ther.	Vib.	Mean Time. h.	m.	s.	Interv. s.	Mean Int. s.
April 30th.	20° 0	88.0	1	0	43	49.4	302.2	301.57
	12 45	——	101		48	51.3		
	8 15	——	201		53	53.1	301.5	cor. for temp. 1.43
	4 0	——	301		58	54.1	301.0	
								300.14
Another set.	20 0	88.0	1	1	1	49.0	302.2	301.60
	12 45	——	101		6	51.2		
	8 15	——	201		11	52.6	301.4	cor. for temp. 1.43
	4 15	87.8	301		16	53.8	301.2	
								300.17
May 3rd.	20 0	87.0	1	0	45	37.7	302.5	301.97
	12 45	——	101		50	40.2		
	8 30	——	201		55	42.1	301.9	cor. for temp. 1.38
	5 0	——	301	1	0	43.6	301.5	
								300.59

No. 3, not marked.

				h.	m.	s.	s.	s.
April 26th.	20° 0′	85.2	1	3	43	6.1	311.0	310.70
	12 30	——	101		48	17.1		
	9 0	——	201		53	27.5	310.4	cor. for temp. 1.31
								309.39
April 30th.	20 0	87.8	1	1	25	17.3	312.1	311.50
	11 45	——	101		30	29.4		
	7 30	——	201		35	40.7	311.3	cor. for temp. 1.40
	4 0	87.3	301		40	51.8	311.1	
								310.10

or we have for the time of performing 100 vibrations at the temperature of 60° Fahrenheit at *Madras*.

Needle 3, ×	Needle 3.
s.	s.
300.14	309.39
.17	310.10
.59	
Mean, 300.30	Mean, 309.74

If h and h' represent the magnetic intensities at any two places, and T and T′ the times of performing 100 vibrations at those places, then we have

$$\frac{h}{h'} = \left(\frac{T'}{T}\right)^2$$

applying this, the horizontal magnetic intensity for *Madras* (that at *London* being assumed = 1.) becomes

	s.
By Needle No. 3, ×	2,1738
Ditto ditto No. 3,	2,2245

With a view to compare theory with practice, we might now compute the number of oscillations which No. 3 × ought to make at *Madras* from the observed number in *London;* thus, assuming the Dip for *London* to be 69° 10′ N. the formula becomes

$$\left\{3 + \text{sec.}^2(69^\circ\ 10')\right\}^{\frac{1}{2}} : \left\{3 + \text{sec.}^2(6^\circ\ 52'\ 30'')\right\}^{\frac{1}{2}} :: \overline{462,76}^{\,2} : T^2$$

performing the computation T = 344,87 differing to the amount of 44,57 seconds from the observations. This difference between theory and observation, is but one of many instances which have from time to time occurred in the infant state of a science. Observation has led us to a theory, and then again has shewn the incompleteness of such theory. In the case of Magnetism, we have long since been prepared to expect that local causes might considerably interfere with its established laws; since one station (the island of *Teneriffe*) has already exhibited some singular anomalies, both in respect to the Dip and Intensity. Under these circumstances it is much to be wished that observations could be multiplied in various parts of India, whereby the law of variation from theory may be detected;—and how is this to be accomplished? My answer is ready:—Let any gentleman who is disposed to undertake a set of magnetic intensity experiments signify his intentions; and I shall have great pleasure in forwarding to him, free of expense, a magnetised and compared needle, provided that I am favored with a copy of the results. In anticipation that there will be several gentlemen disposed to forward this inquiry, I am now preparing several needles for use. All that is necessary is, that the person applying for a needle should be in possession of a good clock or chronometer, and has the means of ascertaining its daily rate.

Madras Observatory, 9th May, 1837.

Note.—We shall be most happy to promote the author's views by making a series of experiments with his needles in Calcutta, and then distributing them to friends in the interior. Of the dip we have a few records, (see Proc. As. Soc. for May.) Major B. Blake also brought from England an adjusted intensity needle, but we have not yet been favored with his observations.—Ed.

VI.—*The Legends of the Saurashtra group of Coins deciphered. By* James Prinsep, *Sec. As. Soc.*

Those who would deprecate the study of old coins as a useless and uninteresting waste of time and ingenuity,—and there are such we fear even among the readers of this journal,—frequently mistake the means